PATENT ABSTRACTS OF JAPAN

(54) PULSE MEASURING DEVICE

(57)Abstract:
PURPOSE: To provide a pulse measuring device which is able to know easily the degree of movement strength and the range of proper movement strength according to a body condition or the like.
CONSTITUTION: The display portion 4 of a device main body is made up of a numeral display portion 4a to display numerals such as the number of pulse; and a bar graph display portion 4b to display movement strength by means of bar graph by dividing it into 10 stages in the range of 0-100%. In the case where movement strength calculated on the basis of a pulse measurement value is within the range of proper movement strength, the movement strength is displayed by means of a long bar graph, and in the case of not within the range of proper movement strength, the movement strength is displayed by means of a short bar graph, and at the same time a mark 21 (the case of movement strength being too weak) or a mark 22 (the case of movement strength being too strong) is displayed.
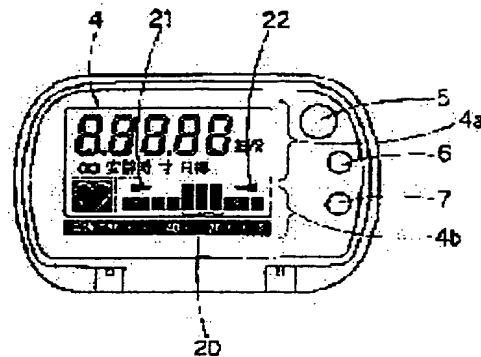
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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] this invention relates to the pulse measuring device equipped with the function which computes and displays exercise intensity by measuring a pulse.

[0002]

[Description of the Prior Art] By exercising, a pulse rate increases and it is known that the increase in this pulse rate is proportional to the strength of movement. Therefore, the exercise intensity at that time can be known by measuring the pulse rate under movement or immediately after movement.

[0003]

[Problem(s) to be Solved by the Invention] However, with the conventional pulsometer or a conventional heartbeat meter, since only a pulse value is displayed, movement performed now cannot judge easily whether it is safe and is effective in a healthy maintenance and improvement, or the enhancement in physical strength. Moreover, although what shows the domain of a suitable pulse rate is in the wrist watch with the pulsometer, there is a trouble where the domain of a pulse rate shown by a user's body status (for example, when it is sick and the kinesitherapy is performed), physical strength and condition, the purpose of movement, etc. not necessarily is not necessarily suitable. For example, if a pulse rate when smooth when physical strength has weakened in convalescence etc., and healthy is exercised for a standard, exercise intensity will be too strong and will worsen condition on the contrary.

[0004] Therefore, this invention was made paying attention to the above-mentioned trouble, and aims at offering the pulse measuring device which can know easily the degree of exercise intensity, and the domain of proper exercise intensity according to the body status etc.

[0005]

[Means for Solving the Problem] In order to attain the aforementioned purpose, the pulse measuring device of this invention In a thing equipped with the display which computes exercise intensity from the data of a pulse rate, the data of age, and the data of pulse measurement at the time of the rest inputted beforehand, and displays the computed exercise intensity When the exercise intensity by which the aforementioned display displays exercise intensity in 0 - 100% of the domain, and was computed corresponds to proper exercise intensity, it is characterized by being what displays the domain of the proper exercise intensity in distinction from other domains.

[0006]

[Function] The data of a pulse rate and the data of age are beforehand inputted at the time of the rest, from the data of the pulse measurement under these data and movement or immediately after movement, the exercise intensity at that time is computed automatically, and the computed exercise intensity is displayed in the domain which is 0 - 100%. And when the exercise intensity is a person's in question proper exercise intensity, the domain of the proper exercise intensity is displayed in distinction from other domains. Therefore, if a display is seen, a user is quite obvious whether it is that the exercise intensity at that time is proper, and can know.

[0007] When exercise intensity is too strong by establishing the advice means which carries out advice to movement, a movement pace is dropped, on the other hand, in being too weak, it raises a movement pace, so that exercise intensity may become a proper exercise intensity domain, when exercise intensity is not proper exercise intensity, and it is advised by the advice means so that exercise intensity may become a proper exercise intensity domain. Thereby, a user can control the strength of movement and can maintain exercise intensity always proper.

[0008] what it is desirable that they are the marks (a character, notation, etc.) which are displayed on a display, and which direct proper exercise intensity, exercise intensity is not proper if the mark

is displayed, and should just strengthen exercise intensity according to the display gestalt of a mark as an advice means -- or what to weaken can be known easily You may use sound (voice, audible tone, etc.) besides this mark, and light (blink, photogenesis, etc.).

[0009] In addition, the calculation formula for asking for exercise intensity with the equipment of this invention is as follows.

$$\frac{運動時脈拍数－安静時脈拍数}{推定最大脈拍数－安静時脈拍数} \times 1 0 0 = 運動強度（\%）$$

However, a pulse rate is a pulse rate by which the movement direct rear stirrup was measured during movement at the time of presumed maximum pulse-rate =220-age, the value to which a pulse rate and age were beforehand set by the user at the time of the rest, and movement.

[0010]

[Example] Hereafter, the pulse measuring device of this invention is explained based on an example. The appearance perspective diagram which looked at the appearance perspective diagram of the equipment concerning one example from the mainframe background to drawing 1 is shown in drawing 2 , and the side elevation is shown in drawing 3 . It is what is [this pulse measuring device] small portable, and it consists of a mainframe 1 and a free wheel plate 2, and a mainframe 1 is formed in the pulse sensor 3 which it is prepared in the background of this mainframe 1, and a finger is placed, and detects a pulse from a finger, and the side front of a mainframe 1, and is equipped with the display 4 which displays the pulse detected by the pulse sensor 3. Furthermore, switches 5, 6, and 7 are arranged at the side of a display 4. A free wheel plate 2 can protect these body surfaces side, such as a display 4 and the switches 5, 6, and 7, and it can open and close freely by the hinge link 8 to a mainframe 1. Furthermore, a clip 9 is attached in the side front of a free wheel plate 2, and using this clip 9, equipment is stuck to trousers, the belt of a skirt board, etc., and is carried.

[0011] An example of the circuit arrangement of the above equipments is shown in drawing 4 with a block diagram. The pulse sensor 3 is a sensor for detecting a pulse wave, and consists of a light emitting device (for example, infrared photogenesis Light Emitting Diode) and a photo detector (for example, photo transistor). A current regulator circuit 10 is a circuit for supplying a current to the light emitting device of the pulse sensor 3, and ON/OFF is carried out by the control circuit 11. A control circuit 11 consists of a microcomputer and its circumference circuit, and controls a display of ON/OFF of a light emitting device, a detection of a pulse-wave signal, a pulse rate, exercise intensity that were calculated, etc., etc. A display circuit 12 is for displaying a pulse rate, exercise intensity, etc., for example, consists of LCD (liquid-crystal-display element). An amplifying circuit 13 is a circuit for amplifying the signal from the photo detector of the pulse sensor 3, and a comparator circuit 14 is a circuit for extracting a pulse-wave synchronizing signal from the amplified pulse-wave signal. Moreover, switches 5-7 are for changing an operation of a control circuit 11, and a power circuit 15 is the power of equipment and consists of a cell.

[0012] The display 4 of the mainframe 1 of equipment is the display gestalt which is shown in drawing 5 , and consists of digital display partial 4a which roughly divides and displays numbers, such as a pulse rate, and the bar graph display part 4b which divides exercise intensity into several steps story (this example ten phases) in 0 - 100% of the domain, and is displayed by the bar graph. Among these, exercise intensity is divided into ten phases 10% by unit (0 - 10%, 11 - 20%, ..., 91 - 100%), and is displayed, and bar graph display part 4b which is the characteristic feature of this invention is [.. The display of (%)" is prepared.] "exercise intensity to the bottom... It is 40.. It is 70. At this example, the exercise intensity among bar graphs is ".. The bar is long rather than the bar graph of domains other than this, and the bar graph fraction 20 20 equivalent to 70", i.e., the bar graph fraction of the domain whose exercise intensity is 41 - 70% as shown to drawing 6 in an

enlarged view, shows that the domain of proper exercise intensity is 41 - 70%. This proper exercise intensity domain is an effective exercise intensity domain, in order to maintain health, and it depends on it being supposed that it is desirable to exercise generally with 40 (for it to be 41% for convenience here) - 70% of the exercise intensity of the maximum exercise intensity.
[0013] In addition, the switch 5 arranged at the close attendants of a display 4 is a pulse switch, a switch 6 is for checking - target pulse rate etc. at the time of the rest, and a switch 7 is a configuration switch for inputting age etc. Furthermore, in this example, bar graph display part 4b has the marks (advice means) 21 and 22 which advise on exercise intensity that it becomes a proper exercise intensity domain, when exercise intensity is not proper exercise intensity. As a mark 21 is shown in (a) of drawing 7 , when the measured pulse rate is a part for 100 beat/and the exercise intensity at that time is 21 - 30%, this shows that it is clearly lower than a proper exercise intensity domain (41 - 70%), and expresses the meaning of "shall we raising the pace which exercises since movement is too weak and cannot expect an effect?"
[0014] On the other hand, when the exercise intensity at that time is 81 - 90%, the measured pulse rate is a part for 164 beat/, exercise intensity shows that it is high compared with a proper exercise intensity domain, the mark 22 of (b) of drawing 7 has too strong "movement, and unreasonableness produces it in the body. The meaning" which should drop the pace which exercises is expressed. However, when the computed exercise intensity is 0% or less, exercise intensity is not displayed but only a mark 21 is displayed. Conversely, it is contained in the exercise intensity at 100% of the time when the computed exercise intensity is 100% or more.
[0015] You may display in a character which replaces with these marks 21 and 22, for example, is shown in drawing 8 . In (a) of drawing 8 , it is the example of a mode which displays as 23 when exercise intensity is too strong, and is displayed as 24 in (b) of drawing 8 when too weak. In addition, a character, such as "a pace is raised" and "dropping a pace", may express more concretely.
[0016] Next, an example is given and explained about the display gestalt of a display 4. Here, the case for 75 beats/of pulse rates is shown at the time of 40 years old of age, and the rest. First, after putting a cell into the mainframe 1 of equipment, it is in the status of drawing 9 as shown in (a) in the status that equipment is not used. Here, if a switch 7 is pushed, it will change to an age display. furthermore -- a switch -- seven -- pushing -- continuing -- things -- displaying -- having -- **** -- age -- a numeric value -- one -- years old -- every -- progressing -- since -- a user -- age -- displaying -- having had -- a time -- a switch -- seven -- detaching -- if -- predetermined -- age -- setting up -- having -- [-- a view -- nine -- (-- b --) -- reference --] . if a switch 5 is pushed after an age setup, "PULSE" will display -- having -- a pulse -- the referring to [[referring to the (c) of view 9]] which shows that it is in the measurable status In addition, if a switch 5 is again pushed in order to end pulse measurement at this time, it will return to the status of (a) of drawing 9 .
[0017] Pulse measurement is in the rest status which sits on a chair etc. and is relaxed, and carries a finger on the pulse sensor 3 of mainframe 1 background. Then, a pulse is detected from a finger by the pulse sensor 3, and it is displayed as a pulse rate for 1 minute. A switch 7 is pushed in the place where the pulse rate was displayed [refer to (d) of view 9]. Then, a pulse rate is set up at the time of a user's measured rest, and it is displayed as shown in (e) of drawing 9 . The pulse rate (target pulse rate) equivalent to the domain of proper exercise intensity is displayed following a display of a pulse rate at the time of the rest [refer to (f) of view 9]. The lower limit of a target pulse rate, i.e., the pulse rate at the time of 40% of exercise intensity, (a part for 117 beat/) is expressed with the display shown in (f) of drawing 9 . At this time, 41 - 50% of a bar graph blinks, and it is shown that it is the lower limit of a target pulse rate. After a lower-limit display of this target pulse rate, the upper limit of a target pulse rate, i.e., the pulse rate at the time of 70% of exercise intensity, (a part for 149 beat/) is displayed shortly [refer to (g) of view 9]. At this time, 61 - 70% of a bar graph blinks, and it is shown that it is the upper limit of a target pulse rate.
[0018] At 40 years old of age, movement by which a pulse rate goes into 117-149 beats the domain

for /is proper exercise intensity, and this display [a series of] shows that it is effective for the condition of a person's in question now, when a pulse rate is a part for 75 beat/at the time of the rest. In addition, the target pulse rate in (f) and (g) of drawing 9 is computed by the following calculation formula, respectively.
the time pulse rate of the time pulse-rate upper-limit (70% exercise intensity) =(time pulse rate of presumed maximum pulse-rate-rest) xof lower-limit (40% exercise intensity) =(time pulse rate of presumed maximum pulse-rate-rest) x40/100(%)+ rest70/100(%)+ rest -- however if it actually exercises and a switch 5 is pushed the inside of movement, and immediately after movement after checking the lower limit and upper limit of a presumed maximum pulse-rate =220-age target pulse rate, "PULSE" will display like (h) of drawing 10 -- having -- a pulse -- it is shown that it is in the measurable status -- [the same as that of the status of (c) of view 9] And a finger is put on the pulse sensor 3 of mainframe 1 background like the above-mentioned, and a pulse is measured. As soon as the measured pulse rate is displayed, the exercise intensity corresponding to the pulse rate is displayed [refer to (i) - of view 10 (k)]. By (i) of drawing 10 , exercise intensity is 51 - 60%, and it is shown that the measured pulse rate (a part for 130 beat/) is in a proper exercise intensity domain (41 - 70%). It will be desirable that a user maintains the movement pace and exercises at the time of this display.

[0019] The pulse rate (a part for 100 beat/) by which exercise intensity was measured at 21 - 30% shows the status that a proper exercise intensity domain is not reached, and the mark 21 expresses with (j) of drawing 10 the meaning of "raising the pace of movement" so that a pulse rate may go into a proper exercise intensity domain. The pulse rate (a part for 165 beat/) by which exercise intensity was measured at 81 - 90% shows the status are over the proper exercise intensity domain, and the mark 22 expresses with (k) of drawing 10 the meaning of "dropping the pace of movement" so that a pulse rate may go into a proper exercise intensity domain.

[0020] In addition, when checking a pulse rate and a target pulse rate in the above-mentioned example at the time of the age set up now and the rest, it carries out as follows. If a switch 7 is pushed in the state of (a) of drawing 9 in the case of age, it will be in the display status of (b) of drawing 9 , and will return to the status of (a) of drawing 9 automatically after fixed time progress. If a switch 6 is pushed in the state of (a) of drawing 9 at the time of the rest in the case of a pulse rate and a target pulse rate, a display of (e) - (g) of drawing 9 will be performed in order, and it will return to the status of (a) of drawing 9 automatically after fixed time progress.

[0021] Moreover, when changing - target pulse rate at the time of a pulse rate and the rest at the time of the age set up now and the rest, it carries out as follows. In the case of a pulse rate, the operation about a display of (a) - (d) of drawing 9 is repeated and changed at the time of age and the rest. Only in the case of age, operation about a display of (a) - (b) of drawing 9 is performed. At the time of the rest, in the case of - target pulse rate, a switch 5 is pushed from the status of (a) of drawing 9 , and operation about a display of (c) - (d) of drawing 9 is performed.

[0022] Although the above-mentioned example explained the case where a proper exercise intensity domain considered as 40 - 70% of exercise intensity, it is not necessarily limited to the domain and a proper exercise intensity domain can be suitably changed according to a user's body status, physical strength and condition, the purpose of movement, etc. For example, under 70 - 80%, and an obesity dissolution and the diabetes treatment, it is appropriate to make it and to make 20 - 30% of exercise intensity into a proper exercise intensity domain by rehabilitation 40 to 50% by training for the enhancement in physical strength.

[0023] Moreover, it is applicable also to the pulse measuring device in the deferred type movement load device of a wrist watch type pulse measuring device or the ergometer, a tread mill, etc. although what has the small pulse measuring device of the above-mentioned example portable was explained.

[0024]
[Effect of the Invention] Since the pulse measuring device of this invention is constituted as

explained above, it has an effect like the following.
(1) Since it is what displays the domain of the proper exercise intensity in distinction from other domains when the exercise intensity by which a display displays exercise intensity in 0 - 100% of the domain, and was computed corresponds to proper exercise intensity, it turns out easily whether the movement is proper for the user.
(2) Since it is advised that it raises a movement pace by dropping a movement pace when exercise intensity is too strong by establishing the advice means which carries out advice to movement so that exercise intensity may become a proper exercise intensity domain, when exercise intensity is not proper exercise intensity in being too weak, and exercise intensity becomes a proper exercise intensity domain, a user can control the strength of movement, can maintain exercise intensity always proper, and can perform movement more effective in an authenticity.
(3) what should just strengthen exercise intensity according to the display gestalt of a mark by using marks (a character, notation, etc.) as an advice means -- or what to weaken can be known at a glance
(4) By displaying exercise intensity by the bar graph, he can discriminate a proper exercise intensity domain from other domains easily, and exercise intensity can understand at a glance whether it is safe and effective one.
(5) Input a pulse rate before movement at the time of a user's age and the rest, and by constituting so that the domain of the target pulse rate for exercising in the proper exercise intensity domain may be displayed shows the standard of the intensity, in case it is going to exercise from now on.
(6) By dividing exercise intensity into several steps story in 0 - 100% of the domain, and displaying by the bar graph, it can double with a user's body status, physical strength and condition, the purpose of movement, etc., and the domain of target exercise intensity can be changed easily.